RFID USE CASE

PROJECT CHEMSECURE

Contents

1. Introduction

1.1 Project ChemSecure

- The integration of Oracle Sensor-based systems and Intermec's Reader and Printer technology, into NASA Dryden Flight Research Center (DFRC) Environmax's Hazardous Material Management System (HMMS) providing a comprehensive set of capabilities to capture, analyze, manage, and respond to data from the sensors

1.2 Business Drivers

Business Benefits

- Increased safety –
  - Provide first-aid and critical data to support first responders and decision makers so they are equipped to make the appropriate and timely decisions necessary for the safety, security and protection of people, physical assets and the environment during an emergency involving hazardous materials.
  - Ensure Chemical is placed in appropriate and safe location such that there is no adverse reaction to other chemicals
- Increased security –
  - Manage hazardous material/waste tracking, producing real-time, end-to-end visibility
    - Determine authorization and training of employee carrying chemical
    - Determine approved location of chemical storage
    - Protection and security for all transactions captured via RFID tracking
    - Strong Audit Capabilities
    - Mobile and Wireless Capabilities

2. Use Cases:

2.1 Employee requests to take out Chemical #1 which is authorized to use in their workspace

2.1.1 Business Process w/o RFID

Description

- New inventory is entered into HMMS system when Chemical #1 is ordered.
- When Chemical #1 arrives, information is entered into HMMS and a barcode is printed at the chemical crib. The label is placed on the chemical at the chemical crib.
- Some packages are stored at the chemical crib, others are moved to the Bulk storage facility. Packages/containers can be driven or walked to the Bulk storage facility.
- If stored in the Bulk storage facility, employees must scan their badges at the gate for the front gate to open.
- Employee places chemical in designated location (although there is no verification other than visual verification that the chemical has been placed in the correct location).
- Upon leaving, the gates are opened by the weight of the vehicle.
- To remove Chemical #1, a request is entered into the HMMS system.
- One of three employees accompany the requestor to remove Chemical #1, or one of the three employees brings Chemical #1 to the chemical crib and provides it to the requestor.
- When the chemical is actually removed, its serial number is scanned and linked to the request.
- Chemical #1 is given to requestor.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.1.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into HMMS system.
- When Chemical #1 arrives, information is entered into HMMS and an RFID label is printed and placed on the container at the chemical crib.
- Authorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals are brought in and out using the employee entrance.)
- System successfully verifies the employee is authorized to bring Chemical #1 into the Bulk storage facility.
- Employee and Chemical #1 are scanned as they enter the storage shed.

- System successfully verifies that Chemical #1 belongs in storage shed.
- Employee places Chemical #1 in a storage shed inside the Bulk storage facility.
- A request to remove Chemical #1 is entered into HMMS.
- Employee walks to the Bulk storage facility to retrieve Chemical #1.
- Employee is scanned at the employee entrance at the front gate.
- Employee is scanned as they enter the storage shed.
- Employee and Chemical #1 are scanned as they leave the storage shed.
- System successfully verifies there is a request by this employee for Chemical #1.
- Employee and Chemical #1 are scanned as they leave the personnel gate at the front entrance to the Bulk storage facility.

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.2 Employee requests Chemical #2 which is authorized for their workspace but picks up Chemical #1 instead

2.2.1 Business Process w/o RFID

Description

- Employee requesting chemical #2 submits their pre-approved badge.
- Badge is scanned into HMMS.
- HMMS identifies the employee as an authorized user.
- Chemical #2 is cross-checked with HMMS.
- If employee is approved to use chemical #2, it will be weight and handed to the employee to use in their designated area.
- Employee will never come in contact with Chemical #1.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.2.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into the HMMS system for when Chemical #2 is ordered.
- When Chemical #2 arrives, information is entered into HMMS and an RFID label is printed and placed on the container at the chemical chemical crib.
- Authorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System successfully verifies employee is authorized to bring Chemical #2 into the Bulk storage facility.
- Employee and Chemical #2 are scanned as they enter the storage shed.
- System successfully verifies that Chemical #2 belongs in the storage shed.
- Employee places Chemical #2 in the storage shed in the Bulk storage facility.
- A request to remove Chemical #2 is entered into HMMS.
- Employee walks to the Bulk storage facility to retrieve Chemical #2.
- Employee is scanned at employee entrance at the front gate.
- Employee is scanned as they enter the storage shed.
- Employee picks up Chemical #1 instead of Chemical #2.
- Employee and Chemical #1 are scanned as they leave the storage shed.
- System identifies an error when it tries to verify there is a request by this employee for Chemical #1 – because the request is made for employee to leave with Chemical #2.
- Alert is sent to designated persons.
- Log file is sent to HMMS.
- Light stack or voice alert notifies the employee carrying Chemical #1.
- Alert is sent to security, if there is still no action to place Chemical #1 back in the shed in a specified amount of time.
- ISSUE: If the employee is standing near the RFID reader, how do you know if the employee went back to replace the chemical and pick up the correct one, or the employee went outside with the wrong chemical?
    - This case will not be handled in Phase 1 but needs to be considered for future phases

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.3 Employee requests Chemical #3 for use in their authorized workspace but Chemical #3 is placed outside the Storage Shed when it arrives in Bulk storage facility. It should have been placed inside the Storage Shed, since it belongs in a closed environment.

2.3.1 Business Process w/o RFID

Description

- Employee requesting Chemical #3 submits their pre-approved badge.
- Badge is scanned into HMMS.
- HMMS identifies the employee as an authorized user.
- Chemical #3 is cross-checked with HMMS.
- If employee is approved to use chemical #2 it will be weighed and handed to the requester to use in their designated area.
- At this point HMMS has no way of tracking Chemical #3 until it's returned.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.3.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into HMMS system for when Chemical #3 is ordered.
- When Chemical #3 arrives, information is entered into HMMS and an RFID label is printed and placed on the container at the chemical crib.
- Authorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System successfully verifies the employee is authorized to bring Chemical #3 into the Bulk storage facility.
- Employee and Chemical #3 do not enter the storage shed.
- After a set amount of time, the system notices Chemical #3 has entered the Bulk storage facility, but has not been placed in the storage shed.
- An alert is sent to the appropriate employee's indicating Chemical #3 has not been properly stored.
- Alert is sent to designated persons.
- Log file is sent to HMMS.
- A voice alert is activated toward the employee carrying Chemical #3 to place Chemical #3 inside Shed.
- An alert is sent to security if still no action exists to place Chemical #3 into shed in

specified amount of time.

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.4 Employee requests Chemical #4 for use in their authorized workspace – Employee placing Chemical #4 in the Bulk storage facility is not authorized to carry the material

2.4.1 Business Process w/o RFID

Description

- Employee requesting Chemical #4 submits their pre-approved badge.
- Badge is scanned into HMMS.
- HMMS identifies the employee as an authorized user.
- Chemical #4 is cross-checked with HMMS.
- If employee is approved to use chemical #4 it will be weighed and handed to the employee to use in their designated area.
- Chemical #4 will not be handed to an unauthorized employee.
- If Chemical #4 is passed to an unauthorized employee at any time after its initial issue HMMS would be unable to detect this action.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.4.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into the HMMS system for Chemical #4 it is then ordered.
- When Chemical #4 arrives, information is entered into HMMS and an RFID label is printed and placed on the container at the chemical chemical crib.
- Unauthorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and the container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System notices the employee is not allowed to carry Chemical #4 into the Bulk storage facility and generates an alert to the appropriate employees.

- Alert is sent to designated persons.
- Log file is sent to HMMS.
- Light stack or voice alert is sent to the employee carrying Chemical #4.

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.5 Employee requests Chemical #5 for use in their authorized workspace. Employee picking up the Chemical is not authorized for Chemical #5.

2.5.1 Business Process w/o RFID

Description

- Employee requesting Chemical #5 submits their pre-approved badge.
- Badge is scanned into HMMS.
- HMMS identifies the employee as an authorized user.
- Chemical #5 is cross-checked with HMMS.
- HMMS will deny Chemical #5 to the employee.
- Employee requesting and authorized for Chemical #5 is the only employee authorized to pick-up Chemical #5.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.5.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into the HMMS system for when a Chemical #5 is ordered.
- When Chemical #5 arrives, information is entered into HMMS and an RFID label is printed and placed on the container at the chemical chemical crib.
- Authorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System successfully verifies employee is authorized to bring Chemical #5 into the Bulk storage facility.
- Employee and Chemical #5 are scanned as they enter storage shed.

- System successfully verifies that Chemical #5 belongs in storage shed.
- Employee places Chemical #5 in storage shed in the Bulk storage facility.
- A request to remove Chemical #5 is entered into HMMS.
- Employee walks to the Bulk storage facility to retrieve Chemical #5.
- Employee is scanned at the employee entrance at the front gate.
- Employee is scanned as they enter storage shed.
- Employee and Chemical #5 are scanned as they leave the storage shed.
- System tries to verify the employee is authorized to take Chemical #5, and generates an alert.
- Alert is sent to designated persons.
- Log file is sent to HMMS.
- Light stack or voice alert is sent to the employee leaving with Chemical #5.

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.6 Employee requests Chemical #6 for use in their authorized workspace. Employee bringing Chemical #6 into Bulk storage facility does not have an RFID Badge

2.6.1 Business Process w/o RFID

Description

- Employee requesting Chemical #6 submits their pre-approved badge.
- Badge is scanned into HMMS.
- HMMS identifies the employee as an authorized user.
- Chemical #6 is scanned into HMMS.
- If employee is approved to use chemical #6 it will be weighed and handed to the employee to use in their designated area. At this point access to the Bulk storage facility will be granted.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.6.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into the HMMS system for when Chemical #6 is ordered.
- When Chemical #6 arrives, information is entered into HMMS, and an RFID label is printed and placed on the container at the chemical crib.
- Employee takes the labeled container and enters the Bulk storage facility. Only the container is scanned at the employee entrance at the front gate, since the employee does not have an RFID Badge. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System does not detect an employee carrying Chemical #6 into the Bulk storage facility.
- Alert is sent to designated persons.
- Log file is sent to HMMS.
- Note: We do not currently have an RFID badge therefore, the system does not know which individual is returning the chemical. Because of this, the system sends an alert to that individual instead of sending the alert to security.

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.7 Employee requests Chemical #7 for use in their authorized workspace. Employee removing Chemical #7 does not have an RFID Badge

2.7.1 Business Process w/o RFID

Description

- Employee requesting Chemical #7 submits their pre-approved badge.
- Badge is scanned into HMMS.
- HMMS identifies the employee as an authorized user.
- Chemical #6 is scanned into HMMS.
- If employee is approved to use chemical #7 it will be weighed and handed to the employee to use in their designated area.
- HMMS does not currently issue RFID Badges, approval for removal of a chemical is issued when the Employee's badge is scanned requesting authorization to use Chemical #7 in their workspace.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested

container is removed from the facility and handed to the employee

2.7.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into the HMMS system for when Chemical #7 is ordered
- When Chemical #7 arrives, information is entered into HMMS and a RFID label is printed and placed on the container at the chemical chemical crib.
- Authorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System successfully verifies this is an authorized employee to bring Chemical #7 into the Bulk storage facility.
- Employee and Chemical #7 are scanned as they enter storage shed.
- System successfully verifies that Chemical #7 belongs in the storage shed.
- Employee places Chemical #7 in the storage shed in the Bulk storage facility.
- A request to remove Chemical #7 is entered into HMMS.
- Employee tries to retrieve Chemical #7 from the Bulk storage facility.
- Employee does not have an RFID Badge so nothing is scanned at the employee entrance, at front entrance.
- Employee without RFID Badge enters the storage shed – again the employee is not scanned.
- Only Chemical #7 is scanned as they leave the storage shed.
- Alert is sent to designated persons.
- Log file is sent to HMMS
- Light stack or voice alert is sent to the employee leaving with Chemical #7
- Note: since we don't have an RFID Badge, system does not know which individual is in picking up the chemical to send an alert to that individual – instead the alert should go to security

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.8 Employee requests Chemical #8 for use in their authorized workspace. Chemical #8 does not belong in the Storage Shed, however, the employee carrying Chemical #8 into Bulk storage facility mistakenly places the container in the Storage Shed

2.8.1 Business Process w/o RFID

Description

- Employee requesting Chemical #7 submits their pre-approved badge.
- Badge is scanned into HMMS.

- HMMS identifies the employee as an authorized user.
- Chemical #6 is cross checked with HMMS.
- If employee is approved to use chemical #7 it will be weighed and handed to the employee to use in their designated area.
- Under the current program (HMMS) this would not be detectable. Employees are currently required to return all issued chemicals back to the tool chemical crib for placement in the proper storage area by the chemical crib attendant.

Areas of Improvement

- Security – though one employee's name was entered as the authorized user, another employee may remove the requested container
- Security/Safety –employee may remove an incorrect container
- Inefficient – if there are a large number of requests for chemicals (in and out), there could be a delay in providing a requested chemical to the employee
- Verification – verification of chemical container is completed after the requested container is removed from the facility and handed to the employee

2.8.2 Business Process w/ RFID

Description - Overview

- New Inventory is entered into HMMS system for when a Chemical #8 is ordered
- When Chemical #8 arrives, information is entered into HMMS and an RFID label is printed and placed on the container at the chemical chemical crib.
- An authorized employee takes the labeled container and enters the Bulk storage facility. Both, the employee and container are scanned at the employee entrance at the front gate. (For this pilot, all 12 RFID labeled chemicals will be brought in and out using the employee entrance.)
- System successfully verifies the employee is authorized to bring Chemical #8 in to the Bulk storage facility.
- Employee and Chemical #8 are scanned as they enter the storage shed.
- System tries to verify that Chemical #8 belongs in the storage shed.
- Since Chemical #8 does not belong in the storage shed, an alert is created and sent to the appropriate employee.
- Log file is sent to HMMS.
- Light stack or voice alert is sent to the employee carrying Chemical #8.
- An alert is sent to security if there is no action to place Chemical #8 outside of the shed in specified time.

Benefits

- Increased security – monitoring the employee bringing or leaving with a container, and cross checking it with the requested container
- Increased safety – ensuring chemical is placed in correct location
- Verification– both employee and chemical that they are carrying are scanned and verified when leaving the Bulk storage facility

2.9 Chemical #9 Spills in Storage Shed

2.9.1 Business Process w/o RFID

Description

- This scenario could not be identified by HMMS. Only one of the routine visual inspections of the storage building or vapor detection alarm system would alert of a spill.

Areas of Improvement

- Security/Safety – Appropriate personnel could be alerted of a chemical spill in real time

2.9.2 Business Process w/ RFID

Description - Overview

- Chemical #9 is spills in Storage Shed.
- Spill is spotted by an employee who then calls appropriate first responder.
- First responder puts on a chemical suit and takes a portable RFID reader with PDA and scans the label on the container. He selects the "panic" button to send out alerts.
- An alert is sent to the designated safety officials.
- Critical MSDS information is returned on PDA device to emergency first responders.

Benefits

- First responders receive safety information immediately, allowing the first responder to identify the correct equipment and/or clothes to respond to the spill.

2.10 Chemical #10 Spills in Bulk storage facility but outside Storage shed

2.10.1 Business Process w/o RFID

Description

- This scenario could not be identified by HMMS. Only one of the routine visual inspections of the storage building would alert of a spill.

Areas of Improvement

- Security/Safety – Appropriate personnel could be alerted of a chemical spill in real time

2.10.2 Business Process w/ RFID

Description - Overview

- Chemical #10 is spilled outside of the Bulk storage facility (inside of the main entrance).
- Spill is spotted by an employee who uses a portable RFID reader with PDA to scan the label on the container. The employee selects the "panic" button to send out alerts.
- An alert is sent to the first responder and appropriate safety officials.
- Critical MSDS information is returned on a PDA device to emergency first responders.

Benefits

- First responders receive safety information immediately, allowing the first responder to identify the correct equipment and/or clothes to respond to the spill.

2.11 Chemical #11 Spills outside of the Bulk storage facility area

2.11.1 Business Process w/o RFID

Description

- This scenario could not be identified by HMMS. Only one of the routine visual inspections of the storage building would alert of a spill.

Areas of Improvement

- Security/Safety – Appropriate personnel could be alerted of a chemical spill in real time

2.11.2 Business Process w/ RFID

Description - Overview

- Chemical #11 is spilled outside of the main gate prior to entering Bulk storage facility.
- Spill is spotted by an employee who uses a portable RFID reader with PDA to interrogate the label on the container. He selects the "panic" button to send out alerts.
- An alert is sent to the first responder and appropriate safety officials.
- Critical MSDS information is returned on a PDA device to emergency first responders.

Benefits

- First responders receive safety information immediately, allowing the first responder to identify the correct equipment and/or clothes to respond to the spill.

2.12 Informational Scan – Employee does not remember what chemical is contained in Container #12. Instead of going back to location of HMMS system, they pick up a handheld that is already in Bulk storage facility and scans the RFID Label on Chemical #12. MSDS information is returned.

2.12.1 Business Process w/o RFID

Description

- Information for the chemical is given at the time of issue. Currently, the employee for which the chemical is issued needs to return to the Chemical Chemical crib to identify the type of chemical in the container.

Areas of Improvement

- Security/Safety

2.12.2 Business Process w/ RFID

Description - Overview

- Employee walks into storage shed with handheld reader.
- Employee scans label on Chemical #12.
- MSDS for Chemical #12 is displayed on handheld scanner.

2.13 Hardware Requirements

RFID Tags

- RFID Tags from Intermec.

    - Needed for Chemicals and Employees
- Frequency - Operates in the 902 MHz to 928 MHz band

RFID Readers

- Portal reader – 1-2 Portable Readers for Chem Spill scenario.
- Portal reader – 2 Portal Readers
    - 1 for Entrance to Storage Shed - Indoors
    - 1 for Man-gate at Main Entrance - outdoors

RFID Printers

- Intermec

Other

- Light Stacks (tentative)